Chapter 4: NO_X Budget Trading Program Compliance, Market Activity, and Banking

A review of the second year of cap and trade under the NO_X Budget Trading Program (NBP) shows that the market continues to mature. In 2004, for the first time, a substantial number of sources in 11 states began to comply with the emission reduction requirements under the program. Many of these sources had to make significant reductions to achieve compliance, and the market appears to have played a significant role as participants determined what control strategies to pursue and on what timetable. At the same time, a number of units added controls to meet emission reduction requirements in the non-OTC states between the end of the 2003 and the beginning of the 2004 ozone season.

This chapter examines compliance under the NBP in 2004 and examines trends in this maturing market, including those in allowance pricing and transactions. It also addresses how the high level of banking in 2004 will affect future restrictions on the use of banked allowances for compliance. In addition, this chapter reviews the monitoring and control methods employed by sources to meet program requirements.

2004 Compliance Results

Under the NBP, sources must hold sufficient allowances to cover their ozone season emissions each year. Sources can maintain the allowances in compliance accounts (established for each unit) or in an overdraft account (established for each facility with more than one unit). The overdraft account allows greater flexibility in "bubbling" between units, managing banked allowances from previous years, managing transferred allowances from other sites, and managing allowances purchased from other NBP participants. The sources have a two-month window after the end of the control period to move allowances between accounts (and to buy or sell additional allowances) to ensure their emissions do not exceed allowances held. After the two-month period, allowances may not be transferred into or out of these accounts while EPA reconciles emissions with allowance holdings for program compliance.

Nearly all of the NBP sources that participated in 2004—both electric generating units and industrial units—held sufficient allowances to cover their emissions at the time.

EPA performed reconciliation and identified a single facility with two units that had an allowance deficiency of nine allowances. In cases where the source does not hold enough allowances to cover its emissions, the program requires an automatic penalty deduction (three allowances for each excess ton of emissions) from the source's allocations for the next control period. Table 2 summarizes the allowance reconciliation process for 2004.

NO_X Allowance Trading in 2004

Allowance trading generally comprises three main types of transfers:

1. Transfers within a company or between related entities (e.g., holding company transfers to a small operating subsidiary).
2. Transfers between separate economic entities. These transfers are categorized broadly as "economically significant trades."
3. Transfers from or to the state as allowance allocations or allowance surrenders.

In 2004, economically significant trades represented approximately 40 percent of the total transfers between entities other than a state. The economically significant trades provide the strongest indicator of true market activity, because they represent an actual exchange of assets between unaffiliated participants.

There were more than 230,000 allowances involved in economically significant trades in 2004, slightly lower than in 2003. However, overall trading activity remained robust. As in the earlier OTC trading program, industrial sources have actively traded allowances. These sources traded more than in 2003 and participated in approximately 13 percent of the economically significant trade volume.

Table 2: NO_X Allowance Reconciliation Summary—2004

Total Allowances Held for Reconciliation	**676,574**
Allowances Held in Compliance and Overdraft Accounts	609,249
Allowances Held in Other Accounts*	67,325
Allowances Deducted for 2004 Emissions	468,824
Termination of 2003 Early Reduction Credit (or Compliance Supplement Pool) Allowances**	125
Banked Allowances	**207,625**
Allowances Held in Compliance and Overdraft Accounts	133,857
Allowances Held in Other Accounts***	73,768
Penalty Allowances Deducted** (from future year allowances)**	**27**

Source: EPA

* Other Accounts refers to general accounts in the NO_X Allowance Tracking System (NATS) that can be held by any source, individual, or other organization, as well as state accounts.

** Compliance Supplement Pool (CSP) allowances can only be used for two years. In the OTC states, CSP allowances not used for reconciliation in 2003 or 2004 have been retired permanently.

*** Total includes 6,477 new unit allowances returned to state holding accounts.

**** These penalty deductions are made from future vintage year allowances, not 2004 allowances.

During certain periods, the price for NO_X allowances can reflect market uncertainties as companies evaluate ongoing trends in control installations, energy demand, and other external factors that affect the overall costs of control. In addition, program elements such as progressive flow control and the retirement of compliance supplement pool allowances enter into transfer decisions, as do questions about the integration of the NBP with the recently finalized (March 2005) Clean Air Interstate Rule (CAIR). Despite these uncertainties, allowance prices stabilized in 2004 and are down appreciably from early 2003 (see Figure 25), which is one indication that the cap and trade market has matured.

Figure 24: Economically Significant Trades

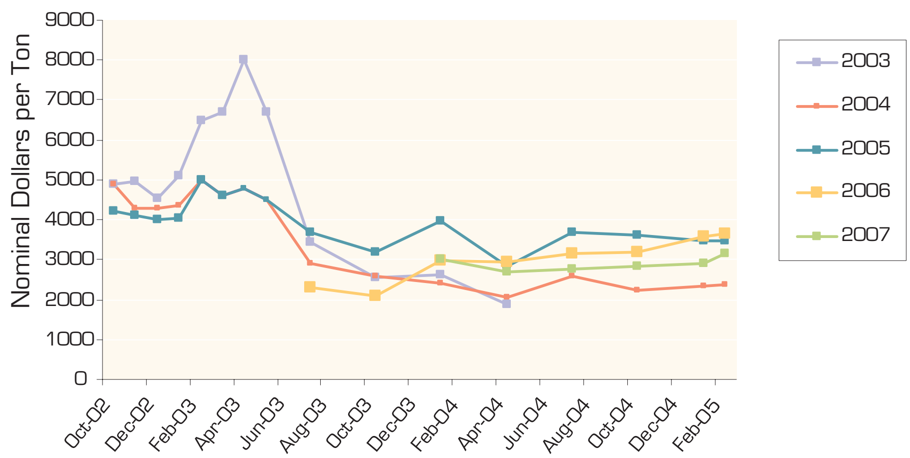
Source: EPA

Banking in 2004 and Flow Control Next Season

Under the NBP, banking provisions allow companies to decrease emissions more than what was required early in the program, and then save unused allowances for future use. Banking results in environmental and health benefits earlier than required by the NBP and provides a pool of allowances available to address unexpected events or smooth the transition into deeper emission reductions.

If sources use a large number of banked allowances in one year, the elevated emissions could potentially reduce the environmental effectiveness of the NBP. The NBP's progressive flow control provisions were designed to discourage extensive use of banked allowances in a particular ozone season. Flow control is triggered when the total number of allowances banked for all sources exceeds 10 percent of the total regional budget for the next year. When this occurs, EPA calculates the flow

Figure 25: Vintage Year NO_X Allowance Prices by Month of Sale



Source: Evolution Markets, LLC and Cantor Environmental Brokerage control ratio by dividing 10 percent of the total trading budget by the number of banked allowances (a larger bank will result in a smaller flow control ratio). The resulting flow control ratio indicates the percentage of banked allowances that can be deducted from a source's account in a ratio of one allowance per ton of emissions. The remaining percentage of banked allowances, if used, must be deducted at a rate of two allowances per one ton of emissions.

With a large number of additional sources in 2004 and the addition of Compliance Supplement Pool (CSP) allowances to states' budgets, the level of banked allowances in the NBP increased to nearly 208,000, well beyond the previous year's total of more than 28,000. These banked allowances represent 40 percent of the total allocations for the 2005 ozone season. Because this ratio exceeds 10 percent, flow control will be triggered in 2005.

Continuous Emissions Monitoring System Results

In order for NO_X allowances to be accurately tracked and traded, NBP sources must use consistent monitoring procedures to determine their emissions. Accurate and consistent monitoring ensures that all allowances in the NBP have the same value (i.e., a ton of NO_X emissions from one NBP source is equal to a ton of NO_X emissions from any other source in the program). Analysis of the continuous emissions monitoring data reported by NBP sources in 2004 convincingly demonstrates the high quality of the data (see Figure 26).

Industrial sources, many of which have been monitoring under EPA's detailed monitoring procedures (40 CFR Part 75) only since 2003, were able to perform at nearly the same level as electric generating units, most of which have been monitoring under Part 75 for about a decade. In 2004, both the electric generating units and industrial units passed more than 98 percent of the quality assurance tests required of their monitoring systems. These tests included:

- Daily calibration error tests, which use reference gases of known concentrations, or (for flow monitors) reference signals with known values, to test a monitor at a zero point and an upscale point.
- Quarterly linearity checks (for gas monitors, only), which are similar to the daily calibration procedure but performed at three intermediate gas concentrations across the range of the analyzer.

Flow Control Will Apply in 2005—How Will It Affect Sources?

• 2005 Regional Budget:	516,245 allowances
• Banked Allowances after 2004:	207,625 allowances
• Flow Control Trigger:	207,625/516,245 > 10 percent, triggering flow control for 2005

- The flow control ratio will be 0.25 (determined by dividing 10 percent of the total trading program budget by the total number of banked allowances, or 51,625/207,625).
- The flow control ratio is applied to banked allowances in each source's compliance and overdraft allowance accounts at the time of compliance reconciliation.
  - For example, if a source holds 1,000 banked allowances at the end of 2005, it will be able to use 250 of them on a 1-for-1 basis, but will have to use the remaining 750, if necessary, on a 2-for-1 basis for compliance.
- If the source used all of its 1,000 banked allowances for 2005 compliance, the banked allowances could be used to cover only 625 tons of NO_X emissions (250 + 750/2).

- Semiannual or annual relative accuracy test audits which compare data from the monitoring system to concurrent measurements of the stack emissions with an EPA reference test method.

NBP sources also reported quality-assured emissions data for more than 99 percent of their operating hours in 2004 (see Figure 26). Part 75 requires conservatively high substitute data values to be reported for missing data periods, but substitute data were used less than 1 percent of the time in 2004 and therefore had little impact on the cumulative NO_X mass emissions reported by the NBP sources.

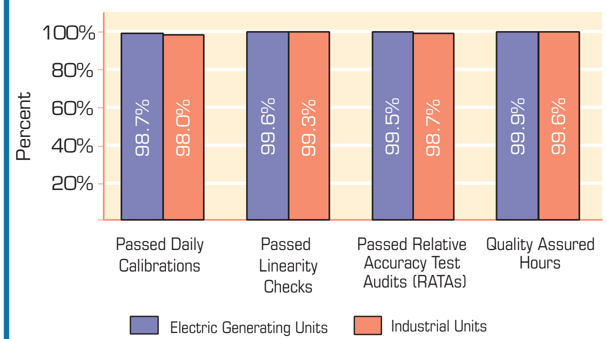
Compliance Options under the NOx Budget Trading Program

In a way that best fits their own circumstances, sources can choose from a variety of compliance options to meet the emissions reduction targets of the NBP. These include decreasing generation from certain units (such as units with high NO_X emissions), modifying or optimizing the basic combustion process to control the formation of NO_X, using add-on controls, or purchasing additional allowances from other market participants.

Many electric generating units installed combustion controls to meet the NO_X emission limits of the Acid Rain Program. In addition, some industrial units added combustion controls to meet state NO_X emission limits. For boilers, furnaces, and heaters, these controls include low NO_X burner and overfire air technologies, which modify the combustion process to reduce formation of NO_X from nitrogen present in the combustion air and fuel. Advances in combustion control technologies continue to provide cost-effective options to reduce emissions even further for some units.

Add-on control technologies, such as selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR), are frequently applied for NO_X control. SNCR and SCR are control technologies that achieve NO_X reductions by injecting ammonia, urea, or another NO_X reducing chemical into the flue gas within or downstream of the combustion unit to react with NO_X, forming nitrogen and water. SCR adds a catalyst to allow this reaction to occur in a lower temperature

Figure 26:
2004 NO_X Budget Trading Program Quality Assurance Performance of Continuous Emissions Monitors, Electric Generating and Industrial Units



Source: EPA

Note: These results include approximately 1,300 electric generating and 275 industrial units that reported under the NBP using CEMS in 2004.

What Monitoring Options Can Sources Use?

EPA has developed detailed procedures (40 CFR Part 75) to ensure that sources monitor and report emissions with a high degree of precision, accuracy, reliability, and consistency. Coal-fired units are required to use continuous emission monitoring systems (CEMS) for NO_X and stack gas flow rate (and if needed, CO_2 or O_2 and moisture), to measure and record their NO_X mass emissions. Oil and gas-fired units may alternatively use a NO_X CEMS in conjunction with a fuel flowmeter to determine NO_X mass emissions. For oil and gas-fired units that are either operated infrequently to provide power during periods of peak demand or that have very low NO_X emissions, Part 75 provides low-cost alternatives to estimate NO_X mass emissions. Figure 26 presents only the results for units that use CEMS.

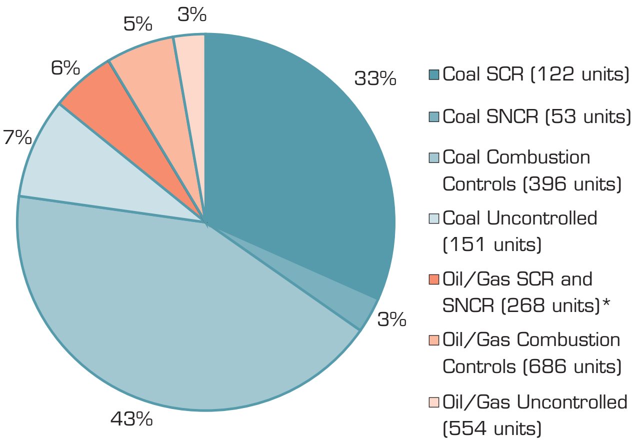
range. While SNCR is mainly applicable to boilers, furnaces, heaters, and kilns, SCR can be used for a wider range of electric generating and industrial units. Sources report pollution control information, including installation dates, in monitoring plans submitted to EPA.

Figure 27 shows the breakdown of how electric generating sources have employed emission controls as of the 2004 ozone season, by both number of units and the percent of total ozone season generation. In the 2004 ozone season, there were about 2,200 electric generating units affected under the NBP. Coal-fired electric generating units with combustion controls (about 400 units) represented 43 percent of total generation during the ozone season. Coal-fired electric generating units with SCR (122 units) constituted about 5 percent of electric generating units, but represented more than 30 percent of the total ozone season generation. In contrast, oil- and gas-fired electric generating units (over 1,500 units) constituted nearly 70 percent of all electric generating units but accounted for less than 15 percent of total ozone season generation.

Figure 28 shows similar information for industrial units, but based on steam output rather than electric generation. In the 2004 ozone season, there were 340 industrial units affected under the NBP. Most industrial units either identify combustion controls in their monitoring plans or do not identify any type of add-on controls. There are only a few exceptions where SCR or SNCR is employed. There are no cases where coal-fired industrial units employ SCR. Except for turbines that can use a relatively simple form of SCR, the use of SCR is typically limited to larger coal-fired electric generating units that can achieve significant emission reductions in a highly cost effective way.

In addition to adding controls, decreasing generation from certain units (e.g., those with high NO_X emissions) and making operational or fuel changes are other methods sources can use to achieve emission reductions. Table 3 shows that the total heat input for all NBP sources increased slightly (less than 2 percent) from 2003 to 2004. The heat input from coal-fired units decreased a small amount, while the heat input from gas-fired units increased. Although there were small differences between fuel types, the overall heat input change suggests that there was no substantial shift from coal-fired units to lower emitting oil- or gas-fired units in 2004.

Figure 27: Percent of Total 2004 Ozone Season Electric Generation by Fuel and Control Type



Source: EPA

* In 2004, only 14 oil/gas units had SNCR, making up less than 1 percent of ozone season generation.

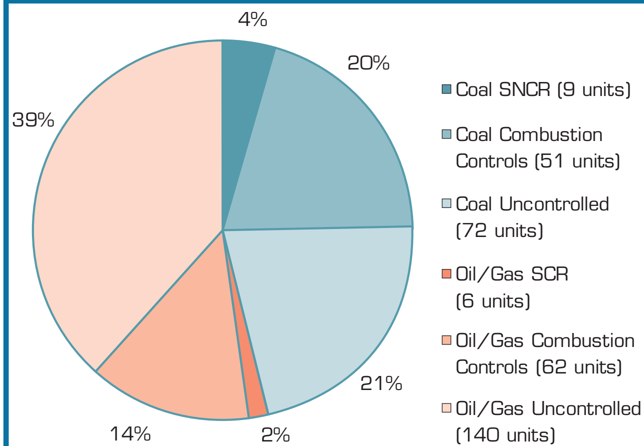
Coal-fired Units Account for Nearly All Emission Reductions since 2003

Table 3 indicates that coal-fired units accounted for nearly all of the 226,000 tons of emission reductions achieved by NBP units from 2003 to 2004. This analysis first examines emission reductions from units that added new controls in 2004 and then focuses on those units that achieved emission reductions with no reported change in controls.

By the end of the 2004 ozone season, 122 coal-fired units reported using SCR controls to meet the NBP requirements, an increase of more than 30 units since the end of the 2003 ozone season. Seven units reported adding SNCR systems during this period, and 17 units reported the installation of new or upgraded combustion controls. Overall, units that installed new controls (since the end of the 2003 ozone season) reduced emissions by about 91,000 tons from 2003 levels. Additional reductions were achieved by units that installed add-on controls in the 2003 ozone season or earlier but operated those controls more in the 2004 ozone season. These units (primarily units with SCR controls) reduced emissions by about 28,000 tons in the 2004 ozone season.

Coal-fired units with no add-on controls and no reported change in their control status after the 2003 ozone season were nonetheless able to reduce mass emissions by more than 100,000 tons from 2003 ozone season levels. To assess how those reductions may have occurred, EPA analyzed these units based on 2003 NO_X rates, ordered by highest to lowest emitters. This analysis excludes coal-fired units in OTC states because those units already had to meet trading program budget requirements in 2003 and did not reduce emissions significantly from 2003 to 2004. In 2004, units with the highest 2003 NO_X emission rates (the top 25 percent) decreased total ozone season heat input by about 15 percent from 2003 levels. The remaining units had only a moderate decrease in heat input (generation), approximately 2 percent. Mass emission reductions were also attributable to emission rate reductions. For example, the units with the highest 2003 emission rates (the top 25 percent) experienced a median emission rate reduction of about 0.12 lb/mmBtu. The remaining units realized a more moderate NO_X rate reduction (the median reduction was about 0.05 lb/mmBtu). While discrepancies in the reported information on types of NO_X controls installed likely explain rate reductions for some of these units, these types of rate reductions also can occur as a result of operational changes or fine-tuning of the existing combustion controls, which sources do not report to EPA.

Figure 28: Percent of Total 2004 Ozone Season Steam Output for Industrial Units by Fuel and Control Type



Source: EPA

Note: Industrial units generally provide generation data as steam output load. Some industrial units provide electrical output data because they provide electrical energy for on-site use. That electrical load data was converted to a steam equivalent (1,000 pounds per hour) to allow consistent comparison of data.

Heat input is the heat derived from the combustion of fuel in a unit. It is a simple way to track utilization of affected units. The overall heat input levels from affected sources in the NBP states increased slightly between 2003 and 2004 without the addition of a significant number of sources. This indicates that, on a systemwide basis, sources in the region were able to maintain their preexisting generation levels while still complying with the NBP.

Table 3: Comparison of 2003 and 2004 Ozone Season NO_X Mass Emissions, Heat Input, and NO_X Emission Rates in the NO_X Budget Trading Program

Units by Fuel Type	Ozone Season NO_X Mass Emissions (tons)		Ozone Season Heat Input (mmBtu)		Ozone Season NO_X Emissions Rate (lb/mmBtu)	
	2003	2004	2003	2004	2003	2004
Coal	770,000 (94%)	548,000 (93%)	4.7 billion (84%)	4.7 billion (83%)	0.33	0.23
Oil	25,000 (3%)	25,000 (4%)	260 million (5%)	260 million (5%)	0.19	0.19
Gas	24,000 (3%)	20,000 (3%)	590 million (11%)	690 million (12%)	0.08	0.06
Total	819,000	593,000	5.57 billion	5.65 billion	0.29	0.21

Source: EPA

Notes:

- Tons rounded to the nearest 1,000 tons. Totals may not equal the sum of the values for each fuel type due to rounding. The data presented here are for the ozone season May 1-September 30.
- The Average emission rate is based on dividing total reported ozone season NOx mass emissions for each fuel category by the total ozone season heat input reported for that category. The average emission rate expressed for the "Total" is the heat input weighted average for the three fuel categories.